NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

AN ASSESSMENT OF THE IMEF DEPOT-LEVEL CORROSION PREVENTION AND CONTROL PROGRAM AND THE VIABILITY OF MAKING IT MORE EFFICIENT AND/OR OUTSOURCING THE REQUIREMENTS THROUGH PRIVATE SECTOR INITIATIVES

by

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December 2002

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ABSTRACT

In an era of both downsizing of Defense Budgets combined with high operational tempo, the military is faced with doing more with less as a way of life. Add to this the overall rise in the average age of the ground tactical and ground support equipment, and both preventative and corrective maintenance takes on added importance. Corrosion Prevention and Control is a necessity in extending the life of our equipment, this is especially true for the Marine Corps, which operates in harsh environments that quickly degrade its gear. While mandated programs at each echelon of maintenance are technically proficient, the Depot-level program, *to include transportation*, in use by IMEF appears to be inefficient. The objective of this thesis research was to analyze the present program used to meet the Depot-level requirements for the West coast and see if gives the Corps the Best Value available. Best Value in this case considers both the effect on equipment readiness and overall cost. The present program to protect the assets is efficient and mostly cost effective, yet the transportation procedures are inefficient and not cost effective. This unnecessarily degrades readiness for the war fighter. It is proposed that implementing both the use of organic transportation assets and utilizing outsourcing will greatly improve Readiness levels to IMEF and lower overall program costs.

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I. INTRODUCTION

Maintenance of the Marine Corps tactical ground, and ground support equipment, is a constant challenge in an era of downsizing of personnel and ever decreasing budget constraints. These factors, combined with the overall average rise in age of this equipment, have made it imperative that the Corps continues to seek out and implement new supply and maintenance programs, which give the best overall value to our Marines. Military logisticians in all branches of the Services are faced with this same dilemma. They must continually reinvent their business practices and overall doctrinal philosophies in a constant search for greater efficiency.

Many traditional “in-house” programs are put in to competition against private sector initiatives, and if certain minimum criteria are met, many programs are quickly outsourced. This competition for business between military organizations and the private sector is based on numerous factors, not only in terms of overall price, but also in terms of efficiency, which can be measured by length of repair cycle time. The quicker the turnaround of an item, the faster it can be returned to the war fighter to as an integral tool to accomplishment their mission. Depot level programs are not immune to this comparison and competition. Neither are the current Corrosion Prevention and Control Programs (CPAC) being run at Marine Corps Logistics Bases in Albany and Barstow.

This thesis analyzes the current CPAC Programs, and determines if there are viable options, which could improve

readiness levels to the Operating Forces and decrease costs at the same time. It also takes into consideration the transportation of this equipment to and from the Depot as part of the overall process (for comparison purposes only). This thesis deals solely with tactical ground and ground support equipment and does not deal with aviation assets. It is limited in scope to the equipment of the I Marine Expeditionary Force (IMEF).

A. OBJECTIVES OF THIS RESEARCH

The objective of this research is to determine the best value available to the Marine Corps Operating Forces to accomplish Depot level Corrosion Prevention and Control requirements. Can the current process be improved, is there a viable commercial alternative or is the present program the best value? A productive high quality program of both preventative and corrective maintenance is imperative to the preservation of the ground equipment. This overall program continues to take on additional importance as our ground assets have consistently seen their service life extended - due to budget shortfalls for procuring new replacement equipment. The restoration of tactical and support ground equipment to full operational status is essential to enabling these assets to meet their mission requirements. This thesis is intended to help in deciding if replacement or augmentation of the current program is a viable option.

B. SCOPE

This thesis analyzes the need for the Depot level CPAC program, and why this requirement is essential in extending the service life of these pieces of equipment. It shows how the Marine Corps equipment is particularly susceptible

to corrosion and moisture intrusion damage based on the geographic locations and environments in which they operate. In addition, numerous deployments at sea, and storage in open-air storage environments, only add to this problem. As a result, a preventative maintenance program in this area is both sound and an essential maintenance policy.

It gives a background on why the Depot level program was installed; discusses how it has progressed through the years, and where it is currently headed. It shows the breakdown of the different echelons of maintenance currently utilized by the Marine Corps, and how each handles corrosion inhibition challenges at their level. This goes from the Battalion maintainer level up to the Depot level. It examines the current process flow and organizational structure utilized by the Depot, and analyzes what methods have been implemented for the transportation of this equipment both to and from the Depot and how this effects the total time the equipment is away from the war fighter. Finally, it analyzes the cost to the Marine Corps in terms of both monetary price and operational availability of the equipment.

This thesis then attempts to analyze similar private sector programs and their cost, both in terms of price and the turnaround times for the repair to include transportation time. A similar program would be a commercial program which meets the requirements to arrest corrosion, and thereby preventing equipment degradation. The final portion is a comparison of the current program, any modification of this program and any private sector

facilities that produce the same service, and the possible courses of action this data reveals.

C. METHODOLOGY

There are two primary methodologies used in this thesis for research, analysis and conclusions. The first is a historical method. This gives a good background as to the fundamental reasons for the program, and shows how the actual process flows and operates in its current state. Data and background information will be collected from literature review, Marine Corps Orders and Regulations, publications, various on-line databases and personal interviews. These interviews will include personnel stationed at Marine Corps Logistics Base, Barstow, and Marines from the 1st Force Service Support Group, Camp Pendleton. This includes research into how the other Services are meeting similar preventative requirements for their ground assets, and finally, analyze any outsourcing contracts that may have been awarded.

Then, an analytical method is used. This method enables a contrast and comparison of the time and cost information from the various possibilities and presents a conclusion and a recommended course of action. The conclusion will utilize both cost and the length of overall repair cycle time as it affects readiness levels with equal weight.

D. RESEARCH QUESTIONS

The primary research question is the following:

- What is the best value among the set of alternatives examined in this thesis to effectively implement a comprehensive Depot Level Corrosion Prevention and Control Program?

The subsidiary questions to be addressed in assessing this question are as follows:

- What is Corrosion Control?
- Why is it important?
- How does the US Marine Corps currently implement this program? At each level of maintenance.
- How are similar private industry programs implemented?
- Has this level program requirement been outsourced, and if so, what are the results?
- Can utilizing private sector programs reduce costs?
- Can utilizing private sector programs increase equipment readiness to the Operating Forces?
- Can the present program be modified to increase efficiency and return equipment faster to the war fighter at a lower cost?

E. BENEFITS OF RESEARCH

This Research is beneficial for enabling clear and concise decision making with regards to future courses of action. The analysis is intended to determine the Best Value for the customer, the Operating Forces of the United States Marine Corps. In the final analysis, the results may or may not show there is the ability to lower costs and/or lessen repair cycle time by utilizing another process. The intent is to explain all avenues and their possibilities, but not to lower or diminish the current level of quality.

F. CHAPTER OVERVIEW

Chapter II gives some historical background on equipment maintenance and how depot level facilities evolved to their status today. It also explains the different echelons of maintenance currently in use in the

Marine Corps, and precisely what these differences mean to the customer. It further explains the effect these levels have in terms of turnaround repair cycle time, and eventually to equipment readiness. Additionally, outsourcing as a possibility to meet this requirement is addressed.

Chapter III deals with specific aspects of the current program and some of the challenges associated with it at this time. It looks at the program, principally the program at Marine Corps Logistics Base, Barstow, in detail and tracks equipment from when it leaves the Battalion until it returns.

Chapter IV is the analysis of the raw data, both historical in nature and recently collected.

Chapter V deals with conclusions and the recommendations associated with the reaching of those conclusions. It also shows areas for future research.

II. BACKGROUND

> The ability of the U.S. Department of Defense (DOD) to respond rapidly to National Security and Foreign Policy commitments can be adversely effected by equipment related factors. Using available resources, minimization of downtime and maximization of battle readiness must be accomplished through the useful operational life of the equipment. If this is done effectively, equipment can be deployed in a timely and responsive manner and maintained in the field with minimum downtime. (Ref 1)

The maintenance of aging ground tactical and ground support equipment is an enormous challenge to all branches of the military service, and The United States Marine Corps is no exception. Budget restrictions over the last decade have forced the military to cut back on acquisition programs, and to utilize current equipment long beyond their original life expectancies. While the ongoing battle to keep over-aged equipment maintained and combat ready is a considerable burden to the Commander at the unit level, it is also felt at the Depot-level facilities. In an address to the House National Security Subcommittee on military readiness, Major General Stewart, USMC, summed up the importance of Depot-level maintenance when he stated, "The Depot-level Maintenance Program (DLMP) is key to ensuring that there is always a stream of operational equipment flowing back to the operational forces". (Ref 2)

A. HISTORICAL PERSPECTIVE

The concept of Depot-level Military facilities is not new to the department of Defense. The War Department learned from the War of 1812 the importance of logistics and sustainment of their forces. As a result, the original

Government Depots were created to meet future supply and logistical needs of our war fighters. (Ref 3) However, as the War of 1812 became a distant memory, so too were its lessons learned and these Depots fell in to disrepair.

Over 100 years later, World War II was a rude awakening for the military and its readiness. The nation needed to quickly mobilize a massive military complex and did not have a program in place to accomplish that task. As a result, desperate measures were called for and only one week after the brutal attack on Pearl Harbor, Congress authorized the War Powers Act. (Ref 4). This enabled the country to direct commercial activities to produce the goods and equipment necessary to mobilize our military to wage war.

At the same time, the Government quickly acted to set up numerous arsenals, shipyards and Depots to begin to support the ongoing War effort. At the conclusion of the War, the military strategists immediately began preparing for the distinct possibility of both a massive and protracted engagement with the Soviet Union. Preparation for this possibility meant it was necessary to keep this huge complex of entities productive and prepared for the possibility of war on a moments notice.

This era, known as the Cold War, lasted for decades and the structure and capabilities of the Depot facilities remained virtually unchanged. These numerous Depots provided the benefit of a controlled source of maintenance and repair for all military hardware, and many laws were enacted which gave them almost a monopoly on providing these services. Eventually this stalemate ended with the

fall of the Soviet Union, and with it came an end to the era of vigilant readiness associated with the Cold War. This event, and the unrelated quick and decisive victory of our Forces in the Gulf in 1991, led to an era of military downsizing, decreasing defense budgets and competitive outsourcing for goods and services.

With a diminished threat came the formation of the Congressional Base Relocation and Closure Committee. This committee reduced the overall Depot complex from thirty-eight in the 1980's to precisely half that number today. (Ref 5:p 11) A reduction in the overall Service wide personnel levels led to the associated decline in equipment levels, which justified a smaller number of facilities. Of these remaining facilities, the Marine Corps operates two Marine Corps Logistics Bases (MCLB): Albany, in Georgia, and Barstow, in California. The Albany facility supports Marine Corps Forces located east of the Mississippi, and the Barstow facility supports the Forces west of the Mississippi. These two facilities are responsible for the 5th echelon maintenance of ground tactical and ground support equipment in the Marine Corps inventory.

B. RESPONSIBILITIES OF THE DEPOTS

The mission statement of the Marine Corps Logistics Bases is, "To provide supply chain management, maintenance management and strategic prepositioning capability to the Operating Forces and other customers to maximize their readiness and sustainability." (Ref 6)

Depot-level maintenance and repair consists of all programs dealing with repair, rebuilding and with the overhaul of major weapons assemblies. It also includes

some manufacturing of parts, technical support, testing, modifications and even software maintenance. (Ref 5:p 2) Title 10, subtitle A, Part IV of the United States Code governs the conduct of Depot-level maintenance. It essentially requires that the Department of Defense (DOD) to maintain organic repair capability for military equipment to meet certain wartime requirements.

The Defense Authorization Act of 1996 directed the DOD to develop a maintenance policy which:

- Establishes core capabilities that are properly sized to meet security requirements while maintaining cost efficiency and technical competency.
- Provides for organic performance of maintenance and repair of any new weapon system defined as core systems
- Provides for public-private cooperation for non core workloads (Ref 7:p 1)

This Act also specified that a maximum of 40 percent of Depot funding could be used for outsourcing Depot level maintenance to the commercial sector. However, the Defense Authorization Act of 1998 changed that amount to 50 percent vice the previous 40 percent. A May 1995 report by the Commission on Roles and Missions made the recommendation that many functions performed by DOD activities should be either outsourced or privatized, particularly for Depot Maintenance. (Ref 8:p 10)

C. MARINE CORPS ECHELONS OF MAINTENANCE

Both tactical and ground support equipment undergo corrective and preventative maintenance in an ongoing effort to keep this equipment combat ready. Authorization to perform each facet of maintenance is broken down into (3) main categories. These categories are further divided

into (5) levels, termed echelons of maintenance. This system is the basis for all maintenance related activities performed on ground equipment within the Marine Corps. In addition, each level is also responsible for both preventative and/or corrective corrosion inhibition actions.

1. Organizational Maintenance

The first level for all ground equipment maintenance is organizational maintenance, which is performed at the using unit, or owning unit level. It is comprised of both preventative and corrective maintenance procedures. Corrective maintenance is work performed to remedy a specific failure in a piece of gear. Preventative maintenance is designed to prevent a failure from occurring, and consists of routine scheduled inspections and adjustments. This category is further subdivided into two levels: first and second echelon maintenance.

a. First Echelon

This level is primarily where the operator of the equipment, i.e. the driver, takes the responsibility and actions necessary to make minor adjustments to his equipment. This is the first line of defense in preventative maintenance, and first echelon is considered the foundation of the maintenance tier.

b. Second Echelon

This is also at the using unit level, but these individuals are specially trained and qualified, i.e., mechanics, to perform this service. They perform scheduled and routine maintenance functions, limited parts replacement and minor component assemblies. These Marines have received formal school training in their fields.

At these two echelons of maintenance the thorough cleaning of equipment is the only requirement for preventing future corrosion possibilities. A freshwater rinse is one of the simplest yet most effective methods of achieving this. Either the operator or the mechanic easily handles this.

2. Intermediate Maintenance

Performed by designated maintenance activities, i.e., Maintenance Battalion, which is in direct support of the owning unit of the equipment. At this level, Intermediate Maintenance functions would involve replacement and/or repair of parts and certain subassemblies. There is also a limited amount of repair to major assemblies performed at this level. They also utilize mobile repair teams and provide technical assistance as part of their support package. This category is further subdivided into two additional echelons, which are also comprised of school trained Marines.

a. Third Echelon

These personnel perform their maintenance functions in machine shops and are authorized to break down and repair equipment parts further than the organizational level mechanics. In addition, they have the authority to repair and replace parts, subassemblies, and even some major components.

b. Fourth Echelon

These skilled mechanics work in a highly specialized environment with tools and facilities that are more specialized than their third echelon counterparts. They are authorized complete vehicle diagnostic tests. It is the highest level of intermediate maintenance.

These levels of maintenance are responsible for thoroughly sealing equipment they repair as a simple and cost-effective measure to prevent future corrosive degradation. Every effort must also be made at this level to ensure that any possible trapped water is drained as a preventative measure.

3. Depot-Level Maintenance

This level comprises the last echelon of maintenance, fifth echelon.

a. Fifth Echelon

The highest category of maintenance and repair authorized. This level of work is completed at either MCLB Albany or Barstow, or can be outsourced to commercial facilities. These mostly involve major overhauls or complete rebuilding of pieces of equipment and/or major weapons systems. As noted earlier, it may also involve the manufacture of repair parts, and or performing authorized modifications. Civilian contractors can also perform this level of maintenance. (Ref 9)

This level of maintenance utilizes commercial additives and inhibitors to equipment to mitigate and/or prevent corrosion on equipment that has been utilized in harsh training climates.

D. CORROSION CONTROL

Corrosion is the unwanted chemical reaction between a metallic material and its environment, which reduces the strength or other properties essential to the performance of a given item or a system. (Ref 10:Encl 1) Alternatively, more precisely stated, it is "the deterioration of a material, usually a metal, because of a reaction with the immediate environment." (Ref 11)

To both prevent and correct the problems associated with corrosion as it relates to ground equipment; the Marine Corps published Marine Corps Order 4790.18, dated June of 1994. This order deals with the Corrosion Prevention and Control (CPAC) Program and it assigns specific duties and responsibilities to meet the Corps preventative and corrective requirements. It states:

> The essential ingredient to the proper preservation of our assets is a solid and proactive program of preventative and corrective maintenance.
>
> It further states:
>
> The establishment of the CPAC program is an effort to improve readiness and combat capability, to extend the service life of both current and future vehicle and equipment initiatives, an to reduce maintenance requirements and associated costs. (Ref 10:pp 1-2)

E. CONTRACTOR SUPPORT

> Our goal is to capitalize on innovation, experimentation and technology, to prepare Marine Forces to succeed in the 21st century. Our aims are to…enhance experimentation to include ways to accomplish acquisition, logistic and support tasks through technical innovations, outsourcing and their techniques… Marine Corps Strategy 21

The DOD policy governing Depot Maintenance operations is predicated on the ability to provide flexible, timely and cost effective support to its customers. Prior to 1987 these maintenance capabilities were a legacy of the protracted Cold War, designed to sustain engagement with a sizeable enemy on a global scale. Since that time, many support services have routinely been competed with a

growing private sector base that often times gives the customer and DOD a better value. (Ref 5:p 2)

The Defense Authorization Act of 1998 allows for up to 50 percent of Depot level maintenance activities to be outsourced to commercial or private sector activities. As noted earlier, the Depot facility must provide for organic performance of maintenance and repair of any core system. The Office of the Secretary of Defense decides what constitutes a core system. This decision is made from extrapolating information with regard to each Service's role in the Defense Planning Guidance. The current policy still utilizes the two Major Regional Conflict scenarios to make these determinations. CPAC is not designated as a Depot level required Core competency.

The General Accounting Office (GAO) considers that competition from private industry with the public Depots is the main factor in reducing costs associated with Depot-level repairs. (Ref 7:p 2) This factor has dramatically changed the business procedures and processes of these Depots, and they are proving to be increasingly competitive in the marketplace. A GAO commercial activities panel concluded in April of 2002:

> Competitions including public-private competitions have been shown to produce significant cost savings for the government, regardless of whether a public or a private entity is selected. (Ref 12)

Three major changes have affected the entire DOD Depot Maintenance Programs in the last fifteen years. First, the Base Relocation and Closure Committee reduced the overall number of facilities from 38 to 19. Second, the overall

numbers of maintenance personnel have decreased by 59 percent. This is significant in that this is the third highest percentage decrease felt by any category of DOD civilian personnel during this timeframe. The last factor is that the private sector may compete for up to half the traditional Depot workload. While the Depots have scrambled to implement more efficient business practices and processes, the facilities themselves have not had the required capital investment in equipment. (Ref 8:p 10) As a result, as of this year, 44 percent of the total Depot-level workload is being outsourced to private industry. (Ref 13)

The following chart shows how between 1987 and 2000, there has been a significant shift toward outsourcing services by the Depots. The increase of the funds budgeted to Depot level maintenance has grown by 24 percent but of those funds the private sector allocation has raised by roughly 90 percent in that timeframe.

SECTOR	**FY 1987**	**FY 2000**	**CHANGE $**	**% CHANGE**
Public	$8.7	$8.2	$-.5	-6
Private	$4.0	$7.6	$3.6	+90
TOTAL	$12.7	$15.8	+$3.1	+4

*Dollar Figures are in Billions

Table 2.1. Outsource Shift from 1987-2000. (From: GAO Report Titled “Sustaining Readiness Support Capabilities Requires a Comprehensive Plan”, dated March of 2001.

It is important to note that competitions between the public and private sector must take into consideration cost as a factor. Cost must always be considered, but it only

one of many factors which comprise the best value package. Part 15 of the Federal Acquisition Regulation (FAR) states that in competitive regulations the solicitation process is designed to foster an impartial and comprehensive evaluation leading to the selection of the proposal representing the best value to the Government. (Ref 14) It is known as the Trade-Off process, where there may be a trade-off between cost and non-cost factors to allow the contracting office to accept an offer other than the lowest price. Quality of Service, reliability and past performance are valuable considerations in today’s marketplace. Another factor is turnaround time, or Repair Cycle time to include transportation time, which translates to increased readiness to the war fighter.

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III. SPECIFICATIONS

A. MILITARY EQUIPMENT READINESS

In a press release dated March 7, 2002, The Honorable Joel Hefley, the Chairman of the Subcommittee on Military Readiness of the House Armed Services Committee, stated the following:

> I believe that the readiness of our Armed Forces has been on life support for a number of years and that dedicated corrective actions must be taken and sustained to provide the best equipment and facilities for the men and women of the Armed Forces. (Ref 15)

The 1995 DOD Annual Report sums up the importance of Readiness to the military community in just one sentence: "Readiness is the Department of Defense's number one priority." (Ref 16) Readiness is the foundation that enables our Forces to be able to fight and to execute the elements of the National Security Strategy and win our nation's wars. The Department of Defense is mandated under Title 10 of the United States Code to prepare quarterly readiness reports to Congress. This report must contain: (1) each readiness problem and deficiency identified…; (2) planned remedial actions; and (3) the key indicators and relevant information related to each problem and deficiency.

The numbers and statistics that make up this report are derived from the information received from roughly 9,000 military units. These are compiled on a monthly basis from an automated system universally known as Status of Resources and Training System (SORTS). SORTS has recently evolved into GSORTS, which stands for Global

Status of Resources and Training System. As the acronym SORTS is more readily recognized, it will be utilized vice GSORTS in this research. The overall term "Readiness", is comprised of three elements: Personnel Readiness, Equipment Readiness and Training Readiness. This study concentrates solely on the Equipment Readiness portion of this triad, as it pertains to the overall military readiness picture. In particular, this study deals with the equipment of the I Marine Expeditionary Force (IMEF).

B. MARINE CORPS GROUND EQUIPMENT READINESS

Military equipment readiness numbers are derived from a simple mathematical formula. They show the percentage of a particular type asset that are *available* or *mission capable* for the execution of a designated mission. The percentage *not available* is considered "deadlined". The following terminology is utilized in the Marine Corps when dealing with the reporting of ground equipment readiness:

- **Allowance Item:** Refers to the quantity of items allowed to a particular unit as prescribed by the Marine Corps Table of Equipment (T/E), or other authorized allowance publications. For Type I Equipment, Mission Essential Items, the On-Hand Quantity (O/H Qty) should always equal the Allowable Quantity.
- **Deadlined Equipment:** A piece of equipment is considered deadlined when it is Not Mission Capable (NMC). This means it cannot perform its designated combat mission due to the need for critical repairs. NMC is further subdivided into two reporting categories.
- **NMCM:** Not Mission Capable Maintenance. This indicates the equipment is deadlined due to awaiting maintenance.
- **NMCS:** Not mission Capable Supply. This indicates that the equipment is deadlined because it is awaiting parts. (Ref 17)

The mathematical formula that denotes the Readiness Rating of a particular type of equipment in terms of a percentage is as follows:

Readiness Rating = [(Poss. Qty – DL Qty)/ Poss. Qty]

Simply put, it is the number of pieces on hand (possessed), minus the ones designated NMC (DL Quantity), and divided by the number on hand (possessed). For example: Unit A has (20) 5-Ton Vehicles. (4) of these are NMC. The Readiness Rating is 80% = (20 – 4 / 20)

The Marine Corps considers Equipment Readiness as that percentage of a type of equipment that is available to the unit so that the unit is able to perform its mission. However, a piece of equipment may not actually be “deadlined’ to be categorized in the NMC category. It may simply be “unavailable” to the Commander to accomplish his mission. As it is not readily available to the Commander, it cannot be relied on at that time, so it decreases the readiness numbers accordingly. Equipment that has been inducted into the Depot level CPAC, (commonly referred to as the C3 program) are actually Fully Mission Capable (FMC), a requirement of the program. However, it is listed on the SORTS report as technically NMC due to its lack of availability, with the appropriate annotation in the REMARKS SECTION as to why.

Therefore, a decrease in the time required for transportation, storage or the faster eventual return transportation to the battalion would naturally increase readiness percentages. Faster throughput equates to higher readiness. Simply put, the faster equipment flows through

the system (the CPAC process to include transportation), the faster it is returned to the battalion, and the sooner it is available for use by the Commander.

C. CYCLE TIME

IMEF Forces traditionally utilize MCLB Barstow Maintenance Center for their Depot level CPAC requirements. IMEF Marines are located a minimum of 150 miles away in various locations in southern California, with the greatest concentration being at Camp Pendleton in Oceanside. The responsible entities for the transportation of equipment (with regards to CPAC) are governed by two separate contracts. The Transportation Management Office (TMO), MCB, Camp Pendleton, handles the transportation from Camp Pendleton to MCLB Barstow through commercial contracts. The return transportation is done through civilian contractors operating out of MCLB Barstow.

The current C3 Chief at GSM Company, Maintenance Battalion, 1st Force Service Support Group (FSSG), stated that the approximate average turnaround time for a piece of gear to be away from the unit, for this program, is between 56 and 65 days. (Ref 18) He also stated that the time through the program itself is 30 days (for planning purposes) but most gear gets through the program on average in 25 days. (Ref 19) In fact, The Memorandum of Agreement (MOA) between the Commanding General of IMEF and Commander, Maintenance Center, MCLB Barstow, specifies the following:

> Equipment turnaround time at Maintenance Center, Barstow will depend on TAM types and Category Codes selected, but in no case will turnaround time exceed (35) days from induction at Maintenance Center, Barstow to the completion

date. Transportation time is not included in this turnaround time. (Ref 20)

The important thing to remember is that regardless of where the gear is during this process (i.e. being painted in the C3 program, or awaiting return transportation in the open-air lot in Barstow) it is still *NMC.* Reducing the transportation portion of this overall 56 to 65 day process could quickly elevate a battalion's equipment readiness levels. Either the reduction of, or complete elimination of, the transportation days could achieve this.

D. CPAC TRANSPORTATION FOR I MEF UNITS

MCLB Barstow is only 150 miles from Marine Corps Base, Camp Pendleton. However, for planning purposes an average of 175 miles is used, as IMEF units are located in various locations in southern California. Accordingly, an average round trip for a piece of equipment is 350 miles. Two salient questions must be answered. First, what is the fastest yet most economical method of transporting ground equipment from southern California military instillations to the Logistics Base at Barstow? Second, is the trip, in fact, necessary?

1. Speed

Faster turnaround time for assets transported between Camp Pendleton and Barstow and back again has received serious consideration over the years. Yet this thesis will show that the final result is today the equipment readiness levels in IMEF are lower than necessary due to an extremely inefficient transportation process. In early 1998 an MOA for a Secondary Reparable Maintenance Process Test was signed between the CG 1st FSSG and the CG MARCORLOGBASES Albany Georgia. This agreement governed secondary

reparable issues between IMEF and MCLB Barstow. Of note is that the same transportation issues are evident with this issue as are found in the sending of assets to Barstow for the CPAC program. The MOA states the following in the Concept Plan:

> Utilization of existing Garrison Mobile Equipment assets at Marine Corps Base Camp Pendleton California, possibly supplemented by established commercial rapid transit transportation services, has been selected in order to *minimize transit times*. (Ref 21:p 1)

The Garrison Mobile Equipment assets noted above are assets organic to Base Motors, Marine Corps Base, Camp Pendleton. This conclusion was the result of research by the Camp Pendleton Traffic Management Office (TMO) for the Secondary Reparable Test Committee.

2. Costs

In addition to noting that utilizing organic assets sped up transportation, the following was also noted under the Transportation plan of the MOA:

> Marine Corps Base (MCB) Camp Pendleton, California, Garrison Mobile Equipment (GME) will be utilized as the primary means of transportation for the SRMPT items to/from MCLB Barstow, California during the test period of 1 April 1998 through July 1, 1998. The basis of the decision was that GME transportation is more flexible, responsive and economical (*a savings of $130.04 per trip).* (Ref 21:p 4)

The committee concluded that utilizing organic IMEF transportation assets was both the most *efficient* and *cost effective* method of transporting equipment between these locations. However, the current transportation policy does not utilize Base Motors. This is a direct result of a

funding issue. Base Motors requires reimbursement from the IMEF Comptroller for any trips to and from Barstow. However, the funding is already obligated by HQMC to TMO for this requirement, so the comptroller will not authorize reimbursement of scarce O&M funds designated for the Operating Forces. TMO receives funding for "second destination transportation" requirements. It is extremely difficult to redirect these funds to Base Motors, after the fact. The Base Motors Fund Administrator explains it as follows:

> TMO is funded for second destination transportation. Headquarters Marine Corpsprovides an allotment for support of this type. For SWRFT [Base Motors] support- we need the customer to fund the support, either reimbursable or by direct citation of funds- or we'll take a check. This is where the funding problems are. SWRFT did not have funding in place prior to accomplishing the support, and when these funds were provided they were insufficient. That's why our support was discontinued; we couldn't get the cost covered by Base or the MEF. (Ref 22)

The result is a less efficient transportation process that in turn both lowers equipment Readiness levels and is more expensive for the taxpayer.

E. COMMERCIAL PROGRAMS

Major General D. M. McCarthy, USMCR, made the following statement to the Senate Appropriations Committee Subcommittee on Defense in 2002.

> Corrosion Control funding is, as always, a high priority to all Marine Corps units. Current funding provides relief, but the pending requirements for Corrosion Control repairs to equipment located at our home training centers remains a challenge. The aging of our equipment

> plays a major role in this area. We are *outsourcing and competitively bidding* some of our intermediate maintenance requirements as an innovative way to stretch the maintenance dollars. (Ref 23)

Is outsourcing this process an answer to increasing Battalion equipment Readiness levels? The Reserve Forces seem to believe that is the case. In addition, IMEF is also augmenting the Depot level program with a commercial activity. At present, not all the equipment that requires Depot level CPAC induction is being sent to Barstow from the Operating Forces. Some ground tactical and ground support equipment stay in the southern California area for their treatment. Many are sent for service to a small firm located in southern Orange County, less than 20 miles from the front gate at Camp Pendleton. This firm is Drezek Environmental Striping System (DES), and its facilities are located in San Juan Capistrano. The IMEF C3 Chief stated, “Drezek is a vendor who can do almost everything that Barstow can but they are much smaller…they are usually cheaper, they work at their site/San Juan Capistrano, and the turnover is always faster, with exceptions.” (Ref 24) He estimates the average turnaround time for equipment is 12 to 15 days (compared to 56-65 days for equipment sent to Barstow). This private sector program is less expensive with a quicker turnaround time than the present program located in Barstow. The drawback is the facility is not large enough to meet a significantly greater demand.

F. VOLUME FLOW THROUGH MCLB BARSTOW CPAC PROGRAM

Equipment entering the Program at Barstow is divided in to one of three categories depending on their

requirements. These categories are broken down as follows, with A being the simplest and C being the most inclusive:

- **Category A:** Surface preparation, paint and undercoating; no bodywork. (This category is corrective in nature and applies to items painted with latex/alkyd).
- **Category B:** Surface preparation, paint and undercoating with bodywork due to the corrosion replacement or repair of corroded components such as door, battery boxes, or fenders with time of work not to exceed 8 hours.
- **Category C:** Includes everything listed in category B in addition to some component disassembly required to treat corrosion. Bodywork should not exceed 40 hours. (Ref 25)

The volume of items, which have gone through the program under each of these categories for the last three fiscal years, are as follows (the numbers denote total pieces of equipment):

The disparity between FY01 and the other two years results from the timing of receiving funds at the conclusion of the Congressional Budget resolution. It does not indicate there were insufficient funds to meet demand in the other years. The funds allocated for IMEF for this program have been sufficient to meet their demand over these three years.

FY	**Cat. A**	**Cat. B**	**Cat. C**	**Cost**
00	124	70	39	$938,141
01	136	124	128	$3,060,390
02	101	80	10	$910,890

Table 3.1. Money Spent Over the Last Three Fiscal Years by IMEF on Corrosion Prevention at the Depot. (From: Production Controller for the C3 program at MCLB Barstow.

G. SUMMARY

The work performed at MCLB Barstow is vital to equipment readiness, of extremely good quality and the process itself is time efficient. The monetary cost of this service has not been a factor as it has been borne by the MEF comptroller vice the individual Battalion Commanders. Even the transportation costs are paid out of a fund at TMO and pre designated for this service by HQMC. Though the C3 designated funds have decreased steadily over the last few years, it has been of ample size to accommodate the demands of the Operating Forces.

However, the overall program may require process improvement. Taking equipment readiness and overall monetary costs (to include both the program itself and the transportation involved), there may well be viable alternatives. This thesis will show that at present the total time the gear is out of the hands of the warfighter is excessive, and overall costs could be significantly reduced. Using Readiness levels and Cost as evaluation criteria, the next chapter compares two options to the status quo.

IV. ANALYSIS OF ALTERNATIVES

A. COMPARISON OF ALTERNATIVES

Previous chapters established that the Corrosion Prevention and Control Program mandated by Marine Corps Order is considered an essential part of the overall maintenance policy for ground equipment readiness. The key is to implement the requirements of the program in a way that gives the best value to the Operating Forces. Best Value, in this case, is that option which meets the basic program requirements in the most time efficient and cost effective manner.

The following analyzes the present program, (the *status quo*) a variation of this program utilizing Base Motors for transportation purposes, and finally an outsourced commercial option. The comparisons utilize both cost and turn around time (read: Increased Readiness levels) as overall factors in the final decision. Four distinct areas affect Cost and Readiness levels. Of these, the transportation portion of the process has two important factors, transportation turn around time and overall cost. Then, there is the cost involved with the actual protection of the equipment, and finally how these factors affect Readiness levels.

B. TRANSPORTATION EFFICIENCY AND COST

1. Transportation Time Efficiency

Under the present process, a piece of equipment must currently travel an excessively long journey combined with frequent stops, from the Parent Battalion in Southern California, to the Depot for the CPAC program, and back again.

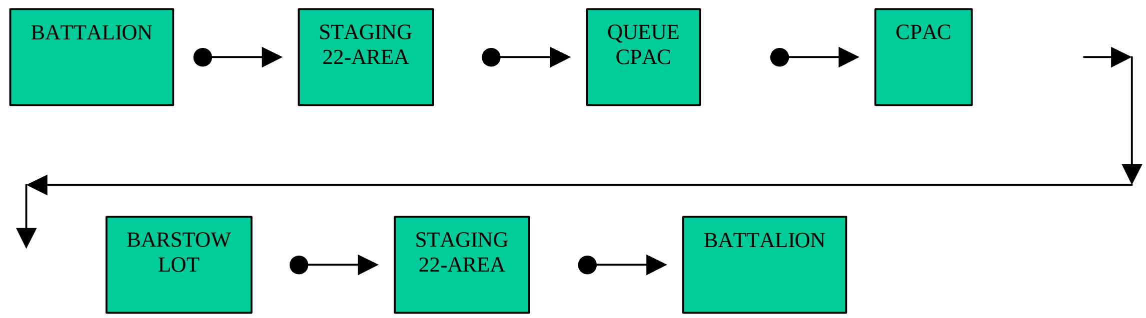

Figure 4.1. Transportation Flow.

A detailed analysis shows the equipment must first travel from the Battalion to the 22-area TMO lot at Camp Pendleton, usually utilizing Base Motors for the journey. Once there, it awaits transportation by civilian contractor for the 150 miles to MCLB Barstow. It arrives and is put in the line/queue for the CPAC Program. From there, it makes its way through the program, and upon completion, it is put in an open-air desert lot. There, it waits for a different civilian contractor to pick it up for return transportation to the 22-area TMO lot back at Camp Pendleton. Here the equipment is unloaded and again waits for Base Motors to move it back to the battalion lot. This complex scheme involves three separate entities in the transportation process: Base Motors; TMO Camp Pendleton contracted carrier; and, the transportation carrier utilized by MCLB Barstow.

The transportation flow chart for when Base Motors handled the transportation during a six-month period from December 2000 through June 2001 was less complex. (Ref 22) It not only eliminated two unnecessary steps in the

process, it also kept all the transportation in the control of one entity, Base Motors, Camp Pendleton.

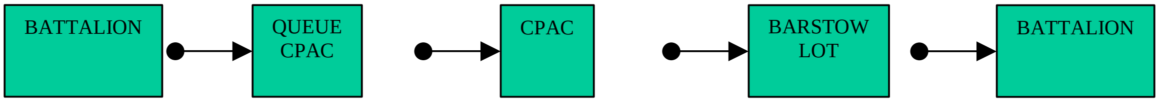

Figure 4.2. Transportation Flow.

Under this process, Base Motors came to the Unit and picked up, receipted for, and transported the gear directly to MCLB Barstow without any intermediate stops. Upon completion of the CPAC program at Barstow, Base Motors was notified and took the gear from the lot in Barstow back to the Unit at Camp Pendleton. This process significantly reduced transportation time for the process as a whole.

Similarly, equipment that is sent to DES, the commercial contractor for its corrosion work, travels a path very close to the Base Motors transportation path.

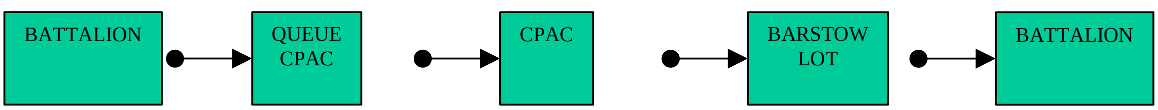

Figure 4.3. Transportation Flow.

The biggest difference is that since the gear goes to San Juan Capistrano vice Barstow, the overall travel distance is only a small portion of that required to get to Barstow and return. This civilian contractor is located within ten miles of Camp Pendleton. This is under ten percent of the travel distance to get to MCLB Barstow.

To find the average travel times for the transportation process of these three scenarios, a simple

formula is used. First, we find the total time the gear is listed as NMC at the Battalion, and then, the average time gear is received and processed through CPAC is subtracted. The result is the travel time.

To find the average time the gear is away from the battalion requires researching the Marine Corps Integrated Maintenance Management System (MIMMS) database. The Maintenance Information Systems Coordination Office (MISCO), located at the 1st FSSG, researched vast numbers of records and provided the raw data needed to find the information required. Table 4.1 is a sample of those records provided, which tell how long the assets were listed as being NMC by the individual battalions.

OWN UAC	DATE RCV	DEST UAC	DATE CLOSED	TAM NR	NOMEN
28301	02112	DREZC	02175	D1159	M1044
28301	02112	DREZC	02175	D1159	M1044
28301	02112	DREZC	02175	D1159	M1044
28321	02112	DREZC	02131	D1158	M1123
28321	02112	DREZC	02131	D1158	M1123
28321	02112	DREZC	02131	D1158	M1123
28321	02120	BARSO	02158	D0880	M149
28321	02120	BARSO	02162	D0880	M353
28321	02120	BARSO	02158	D0880	M353
28301	02120	BARSO	02162	D1159	M1044
28310	02112	BARSO	02162	D0880	M149A2
11400	02112	BARSO	02158	B2460	1150E
11400	02112	BARSO	02162	B2482	C-TRACTOR

Table 4.1. Sample of Records Provided.

Information has been provided on all assets sent to either DES or Barstow for Corrosion Prevention during two distinct timeframes. The first time period coincides with

the six-month window during which Base Motors handled the transportation, and the second, is a similar six-month period with civilian contracted transportation. The civilian contractors mentioned are a combination of both the contractors performing out of Camp Pendleton and those working out of MCLB Barstow.

The database reveals that when civilian carriers are used to travel to MCLB Barstow, the average time the equipment is listed as NMC for the SORTS report is 70.04 days. This is slightly higher than the estimates given by the C3 Chief. The average time the gear is listed as NMC, when it goes to DES in San Juan Capistrano, is only 28.7 days. For rounding purposes, we use seventy-one and twenty-nine days, respectively. The average time the gear was down, when Base Motors handled the transportation to MCLB Barstow, was 45.16 days, or forty-six days, for rounding purposes. (Ref 26)

Next, it is necessary to subtract the amount of time the equipment spent both in the queue at Barstow and through the actual CPAC program itself. The remaining time is that which was taken for transportation. An examination of the C3 tracking report received from the Program Manager at Barstow indicates that the average time for gear to be received and go though the C3 program is a little over 30 days. This is an average of all assets regardless of the category of work being performed at the facility. This time includes waiting time in the line/queue until it begins the program.

RUC #	JON #	CAT	REC	IND	STM	BLT	SHMT	UC	UC	PT	LUB	FINL
					CWC	CWC	CWC	CWC	CWC	CWC	CWC	CWC
			DATE	DATE	746	746	742	744	746	749	744	744
m00373	211s57	a	27-Jun	27-Jun	1-Jul	31-Jul			7-Aug	5-Sep		
m20470	211s56	b	28-Jun	16-Jul	5-Aug	20-Aug	weld	5-Sep				
m00371	211s30	a	9-Jul	19-Jul	20-Aug	29-Aug		28-Aug		5-Sep		
m00371	211s30	a	10-Jul	19-Jul	20-Aug	29-Aug		28-Aug		5-Sep		
m00371	211s32	a	11-Jul	16-Jul	23-Aug	3-Sep				5-Sep		
m20470	211s51	b	11-Jul	16-Jul	25-Jul	13-Aug	13-Aug	23-Aug		29-Aug	5-Sep	
m21300	211s09	a	12-Jul	16-Jul	20-Aug	4-Sep				5-Sep		
m21300	211s40	a	12-Jul	16-Jul	18-Jul	9-Aug	n/a	n/a	n/a	5-Sep		
m21300	211s40	a	12-Jul	16-Jul	18-Jul	9-Aug	n/a	n/a	n/a	29-Aug		5-Sep
m21300	211s09	a	12-Jul	16-Jul	20-Aug	3-Sep				5-Sep		
m00880	211s93	a	12-Jul	16-Jul	20-Aug	3-Sep				5-Sep		
m28333	211s47	b	12-Jul	16-Jul	19-Jul	27-Jul	28-Jul			19-Aug	hold	
m28333	2211s55	b	12-Jul	16-Jul	19-Jul	27-Jul	28-Jul			19-Aug	hold	
m21300	211s14	a	12-Jul	16-Jul	25-Jul	5-Sep						
m21300	211s14	a	12-Jul	16-Jul	25-Jul	5-Sep						
m21300	211s14	a	12-Jul	16-Jul	31-Jul	hold repair						
m11400	211s21	a	18-Jul	22-Jul	27-Jul	13-Aug	23-Aug	29-Aug		5-Sep		
m11400	211s21	a	18-Jul	22-Jul	23-Aug	29-Aug		5-Sep				
m11400	211s30	a	18-Jul	20-Jul	24-Jul	29-Aug		28-Aug		5-Sep		

Table 4.2. Sample of Graphical Chart.

Table 4.2 is one portion of a number of graphical charts provided in an extensive database by the MCLB Barstow C3 program. This particular example breaks down the receipt of individual pieces of equipment by date, and by how long it takes to move through the portions of the process. From this database, it was extrapolated that the time the gear arrives in Barstow, until it completes the program, takes just over thirty days, on average. For rounding purposes, thirty-one days will be used. The average time gear takes to go through DES is fifteen days.

Assets going to Barstow utilizing a civilian carrier are listed as NMC for an average of seventy-one days. The time through the program is thirty-one days. That means

the average amount of time for transportation is forty days. With Base Motors, the turnaround time is forty-six days. Again, the average time of waiting plus processing at Barstow of thirty-one days is subtracted, which leaves an average of fifteen travel days. The average time equipment going to DES is listed as NMC is twenty-eight days, with the average time through the program of fifteen days. Travel time for DES equipment is thirteen days, slightly less than what Base Motors takes for their trip to Barstow. This data reveals that using the current process with civilian carriers to take gear for C3 requirements to Barstow is much less efficient from a transportation time standpoint than the two alternatives.

2. Transportation Cost

The cost comparison between the present uses of civilian carrier(s), as apposed to Base Motors, is not a simple one-for-one comparison. Though there is data for both the six-month time frame Base Motors provided this service, and a similar six-month period for the civilian carrier(s), there are two problems with this approach. First, the exact same loads utilizing exactly the same type of vehicles were not run during those time frames. Secondly, the figures on transportation costs provided by TMO also contain SECREP transportation to Barstow, and it is impossible to distinguish between the two programs for comparison purposes. The MCLB Barstow transportation contractor, EG&G, bills all their transportation to a single line of appropriation, which makes it impossible to distinguish what program the transportation is being billed for at the time. The company states they cannot distinguish between other transportation they perform for

the Marine Corps which is separate from the Corrosion Control Program. (Ref 27).

However, there are two other sources of information for comparison purposes. The first is the TMO study provided for by the MOA between the CG 1st FSSG and CG MARCORLOGBASES, which states that Base Motors should provide the transportation to Barstow and is more "flexible, responsive and economical." (Ref 21:p 4) Though this MOA dealt with secondary reparables vice equipment bound for the C3 program, the transportation requirements were virtually identical.

Secondly, the Fund Administrator for Base Motors provided the following information:

> To aid in your computations - a SWRFT (SouthWest Regional Fleet Transportation, formerly Base Motors)) T/T (tractor-trailer) costs $33.84 per hour (to include driver/fuel/maint/overhead). As a guide – it's a 8 -9 hours trip to Barstow with a tractor trailer, bringing the per trip price to an average of $288 per vehicle – per trip…The difference in price [compared to the civilian carrier] is probably due to TMO/HQMC including civilian labor in their pricing, and the SWRFT only includes temp hire labor for surge requirements in our pricing structure (no GS or WG labor included in our flat rates). Our flat rates were based on out of pocket expenses – not a venue to subsidize labor cost. (Ref 28)

EG&G, the commercial contractor used by MCLB Barstow, charges a flat rate of $494 for one way travel on a flatbed truck to Camp Pendleton. (Ref 27) The cost for both ways is $988. The pricing list from Camp Pendleton is within a couple of dollars of EG&G, making it almost three and a half times the cost to use Base Motors (given the quoted

price of $288 from their Fund Administrator). From a cost of transportation standpoint, the present system is considerably more costly than using organic transportation. The cost to go the small distance to DES using either a civilian contractor or Base Motors is far less expensive than going to Barstow.

C. COSTS TO PROTECT EQUIPMENT

Another cost of the Corrosion Prevention and Control Program is the actual costs to have the equipment undergo the process. The only comparison required here is between MCLB Barstow and DES for performing a similar requirement. Since the most common asset sent to DES by the C3 representative is the HMMVEE, that cost is used for comparison purposes. There are numerous variants of the HMMVEE, as well as different categories of service they may require. The following chart, Table 4.3, lists the price charged by MCLB Barstow for their services, as provided by the MCLB representative to IMEF.

TAM	VARIANT	CAT A	CAT B	CAT C
D1001	M-997	$5602.22	$6336.67	$9274.53
D1002	M-1035	$5051.39	$5785.84	$8723.63
D1125	M-1045/M-1046	$5201.57	$5920.46	$8873.81
D1158	M-998/M-1038/M-1123	$4780.03	$5514.48	$8452.27
D1159	M-1043/M-1044	$5793.31	$6532.76	$9470.55
D1180	M-1037/M-1042	$5793.31	$6532.76	$9470.55
D0187	M-1097	$5793.31	$6532.76	$9470.55

Table 4.3. Price Charged by MCLB Barstow.

The comparable price for DES to do, Framework, undercoating and complete repainting for a D1158 is $4987.00, slightly less than MCLB Barstow. This is the vehicle that constitutes the vast majority of their current work for the Marine Corps.

D. EFFECT ON READINESS LEVELS

> Readiness is the Department of Defense's number one priority. Thus, it is committed to taking those steps necessary to ensure its Forces are ready to execute their missions. (Ref 29)

As stated numerous times, the number one priority for the Department of Defense is Readiness. Readiness is synonymous with Operational Availability (Ao). Ao is simply the number of FMC pieces of equipment, divided by the number of pieces on hand. This is the same formula for Readiness Rating as stated earlier:

Readiness Rating = [Poss. Qty – DL Qty/Poss. Qty]

It is simple mathematics to reason, therefore, that the higher the number of FMC assets the higher Readiness percentage numbers will be. The faster an item is returned to the Commander, the faster it reverts from NMC to FMC. It has already been established that the scenario that designates equipment as being in a NMC status the longest is the current process in effect for C3 requirements for IMEF Forces. This is due to an extremely inefficient transportation process. If Readiness levels are the number one priority in the Department of Defense, any reasonable scenario that raises these levels should be given serious consideration for implementation. It can also be argued that Cost factors directly affect Readiness levels. If the cost is excessive, and/or the funds are not available, readiness will decrease. However, in this case, it has been shown that the funds apportioned have been sufficient to meet the demand requirements.

E. MATRIX SUMMARY

The criteria used here to decide a Best Value course of action for implementing a CPAC program is based on both Readiness and Cost criteria. Both have been given equal weight in the overall evaluation process. Readiness is considered the cornerstone for military preparedness by the DOD, while cost is always a serious concern in an era of shrinking budgets. The analysis of the data gathered has been summarized to interpret the results and assist in recommending a course of action. As Readiness and Cost are weighted equally, there is no requirement to put additional value toward one factor vice another. From the empirical research that has been conducted, the boxes will be filled in as follows: the number (3) denotes the best option, a number (2) denotes the second best option, and the number (1) is for the least favorable option.

SCENARIO	TRANS TIME	TRANS COST	COST C3	READINESS
Present	1	1	*1.5	1
Base Mtr	2	2	*1.5	2
DES	3	3	3	3

* denotes a tie for 2nd and 3rd place.

Table 4.4. Matrix Summary.

By simply adding up the totals for each option, with the highest number indicating the best value option, the results are as follows:

DES Total Point Value 12

Base Motors Total Point Value 7.5

Present Program Total Point Value 4.5

This evaluation criterion shows the Best Value to be to utilize DES to its capacity, which has been shown to be limited. When that resource is quickly maximized, equipment should travel to MCLB Barstow via Base Motors. The IMEF Comptroller should work out arrangements with HQMC to ensure the funds previously designated for TMO for this transportation can be re-designated to Base Motors. This cost should not be borne out of O&M designated funds. The least favorable option, the *status quo*, is far too costly and time consuming and should not be used unless it can be significantly improved upon.

Although the evaluation method may seem overly simple, it suffices in this instance. One could certainly argue that equal weights are not appropriate, for example, between readiness and transportation cost. Another criticism could be made that giving ordinal weights (1st, 2nd, 3rd) to the alternatives is not especially rigorous, because it ignores the detailed comparison data (e.g., on costs) that has been gathered. And in general, a more sophisticated multiple attribute comparison would be recommended. (Ref 30) However, because in this case DES was superior on all criteria, a more sophisticated analysis would not change the result. While a more sophisticated evaluation tool might also be useful in performing sensitivity analysis on our basic result, given the overwhelming superiority of the DES alternative, such an analysis was deemed unnecessary.

V. CONCLUSIONS AND RECOMMENDATIONS

A. IS A DEPOT-LEVEL CPAC PROGRAM NECESSARY?

1. Conclusion

The requirement for a Depot-level CPAC program is, and will continue to be, a priority for the Marine Corps. It has been demonstrated that equipment Readiness is paramount to the war fighter, and this process is an essential part of keeping aged equipment Mission Capable. The value obtained from this process adds considerable life to equipment which continually operates under harsh environments.

2. Recommendation

The need for this requirement is greater than ever, and an even greater emphasis should be made on compliance with the standards of the Marine Corps Order by the individual unit Commanders.

B. IS THE CURRENT PROGRAM FOR I MEF UNITS EFFICIENT?

1. Conclusion

Yes and No. The actual CPAC process currently being run through MCLB Barstow is extremely efficient in its ability to prevent and/or correct corrosion. However, the transportation process for the ground tactical and ground support equipment to and from the Depot is extremely inefficient. In addition to being overly time-consuming, it is comparably expensive. The amount of time the equipment is out of the hands of the Battalion Commander is excessive, and as a result unnecessarily decreases equipment Readiness levels. This inefficiency is due almost exclusively to the complex transportation process being used.

2. Recommendation

The current program needs to be revised. Two options have been demonstrated which are faster than the status quo, result in higher overall Readiness ratings, and are lower in cost.

C. IS THERE SOMETHING SPECIFIC WHICH SHOULD BE IMPLEMENTED TO IMPROVE THE OVERALL PROGRAM?

1. Conclusion

Yes. The analysis has shown that the best option available is to use the present commercial vendor in San Juan Capistrano. This option is limited in that this facility has a limited capability and overall size, which precludes it from performing large amounts of work. The next best option is to use Base Motors to transport the equipment to MCLB Barstow for Depot level CPAC work. The last option, the *status quo*, which uses commercial transportation, has certain drawbacks which prevent it from being considered as a viable option at this time.

2. Recommendation

Implement a process which utilizes the overall Best Value to the Marine Corps. The Best Value is a combination of lowest cost and fastest return of equipment to the war fighter. The analysis has shown that the local vendor option followed by utilizing organic transportation assets will meet this specific set of criteria. While the bulk of this Depot level work will still need to be performed at MCLB Barstow, using Base Motors, vice civilian carriers, will greatly increase Readiness and decrease costs compared to the *status quo*. Aside from these benefits, this system provides customer service in that Base Motors will come directly to the battalion, pick up the gear, and receipt

for it at that time. There will also be one point of contact regarding transportation vice the numerous personnel now involved.

D. WHAT CHALLENGES NEED TO BE OVERCOME TO SUCCESSFULLY ENSURE THE BEST VALUE REMAINS A PROGRAM GOAL?

1. Conclusion

The present program being used by IMEF has some challenges that need to be addressed. The first challenge is the lack of daily oversight for the program as a whole. While there are a number of extremely dedicated and professional civilians and Marines working areas of the program, there appears to be a lack of total oversight. No one single individual handles the total transportation process. It was necessary for the researcher to contact Base Motors, TMO Camp Pendleton and MCLB Barstow to gather transportation data for this thesis. For example, one C3 representative at Camp Pendleton had the majority of data regarding MCLB Barstow, but the other representative had all the DES data. It was difficult to decide who to contact for particular information as everyone concentrated on their own particular area of expertise exclusively.

Even then, creating a coherent total picture of the transportation process was difficult at best. Though the C3 program at Barstow is a model of efficiency, even that operation had two vehicles in their lot that had been waiting 16 days to be returned to Camp Pendleton. Whether these vehicles were undergoing the C3 process, or awaiting transportation, the assets were still out of the control of the war fighter.

2. Recommendation

Greater emphasis should be placed on meeting the needs of the customer, the battalion/squadron Commanders. Their needs are to get their assets back as soon as possible to ensure their ability to meet their individual missions.

E. WHAT CHALLENGES NEED TO BE SOLVED BEFORE IMPLEMENTATION?

1. Conclusion

The first challenge is the inability to transfer the funds currently obligated to TMO for CPAC transportation, to Base Motors. This should involve only those funds needed for CPAC transportation, and doing this would eliminate any necessity to use scarce O&M funds.

The next challenge is to ensure there is a steady flow of equipment to the C3 program to eliminate any bottlenecks in the queue, which may cause a delay in entering the process. Bottlenecks are the result of uneven flows of equipment during the fiscal year.

2. Recommendation

The challenge associated with diverting funds to the correct entity is something that can be solved by the IMEF comptroller, *before the fact.* Prior fiscal year planning should alleviate any problems.

The second challenge is already being worked by the Production Controller of the C3 Program at MCLB Barstow who indicated they were working that issue. However, it is important they take into consideration the needs of the Battalion Commanders. To minimize Operational Tempo disruption, Commanders send assets during the periods they can best afford to be without their equipment. This must take priority over a preconceived schedule at Barstow,

which requires communication and understanding on the part of both parties.

F. TOPICS FOR FURTHER RESEARCH

The research indicated there are some additional areas of research, which may also make this requirement more efficient:

The major challenge discovered in this research dealt with transportation cost and efficiency. Since both Camp Pendleton and MCLB Barstow are located adjacent to major rail lines, this may well be the most efficient use of transportation.

The outsourcing portion of this thesis dealt exclusively with a firm that provided service for a small portion of medium tactical vehicles for IMEF. Are there other firms located in the immediate area that could fulfill these requirements? Is it possible some categories of work could have “tiger teams” visiting the battalion area to perform this service, vice sending the assets away for work?

Finally, the annual CPAC conference shows that private industry is moving toward a dehumidifying process vice the present methods being utilized. The Marine Corps is in fact also interested in moving in that direction. What are the costs and implications of this possibility? How will it affect Readiness and Costs?

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APPENDIX. LIST OF ACRONYMS

Ao	Operational Availability
CPAC	Corrosion Prevention and Control Program
C3	Corrosion, Coating and Control
DES	Drezek Environmental Striping System
DLMP	Depot-Level Maintenance Program
FAR	Federal Acquisition Regulation
FMC	Fully Mission Capable
FSSG	Force Service Support Group
GAO	General Accounting Office
GME	Garrison Mobil Equipment
IMEF	I Marine Expeditionary Force
MCB	Marine Corps Base
MCLB	Marine Corps Logistics Base
MIMMS	Maintenance Management Information Systems
MISCO	Maintenance Information Systems Coordination Office
MOA	Memorandum Of Agreement
NMCM	Not Mission Capable Maintenance
NMCS	Not Mission Capable Supply
SORTS	Status Of Resources and Training Systems
T/E	Table Of Equipment
TMO	Transportation Management Office
TT	Tractor Trailer

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